Base Year: 1999 By: A.K.Fanai/M. Nguyen

SOURCE INVENTORY

CATEGORIES # 324 - 325

FARM EQUIPMENT (GASOLINE & DIESEL POWERED)

1999 EMISSIONS

Introduction

This category accounts for exhaust emissions from agricultural vehicles burning gasoline and diesel fuel while engaged in farming operations.

Methodologies

Prior to the 1999 Base Year emissions, the methodology for farm equipment was based on the published report: "Report on Utility Equipment Emissions in the State of California" by Booze, Allen, and Hamilton (BAH). For each type of equipment, such as tractors, bailers and combines, state-wide annual sales records were available for different types of engine (gasoline and diesel) and power rating (up to 500 hp). These were used, together with scrappage rates established by BAH, to establish equipment population. BAH also developed average hourly use and load factor for each type of equipment mentioned above. The statewide activity (in brake horse-power-hour) was thus estimated. The annual activity was distributed to counties by the acreage harvested in each county taken from the Agricultural Crop Report. Emission factors were obtained from Power Research Systems, the Engine Manufactures Association.

In 1998, the California Air Resources Board (CARB) developed the Off-road vehicle emission inventory (OFFROAD) model to estimate emissions from off-road motor vehicles for all counties and air basins in California. The OFFROAD model contains a more comprehensive list of equipment from a wider range of categories compared to BAH. The OFFROAD model adds an inventory estimate for engines powered by diesel fuel, compressed natural gas (CNG) and liquid petroleum gas (LPG) which were not previous accounted for. Base Year 1999 emissions for farm equipment categories in the Bay Area were obtained from the CARB's OFFROAD model.

Monthly Variation

Monthly variation of emissions was assumed to be 75% for the months of June to October and 25% for the other remaining months.

County Distribution

County emissions were provided by the CARB's OFFROAD model.

TRENDS

Growth

Projected emissions for farm equipment categories were estimated based on ARB's Off-road vehicle emission inventory model. The growth factors utilized in the OFFROAD model are prepared in a report for the Air Resources Board entitled "A Study to Develop Projected Activity for "Non-Road Mobile" Categories in California, 1970-2020". In this report, certain economic indicators are used to project the growth in population and usage of small off-road engines in various applications. In general, the population of small off-road equipment is expected to increase by approximately 34% between 1990 and the year 2010.

Control

In December of 1990, the CARB adopted two levels of emission standards for small off-road engines. The first phase of standards (Tier 1) was implemented in 1995 and Tier 2 standards are scheduled for implementation in 1999. The deterioration rates for 4 stroke Tier 1 engines were derived from data supplied by engine manufacturers. Since engines meeting Tier 2 standards are not yet available, engineering judgment was used to estimate the effect of the more stringent standards.

Projected emissions include expected benefits from ARB's Clean Diesel Regulations in 1993, Re-Formulated Gasoline Phase II and EPA's diesel engine standards beginning 1999. These benefits were estimated using control factors developed by ARB.